



GSI-191 Chemical Effects Update

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Outline

- Review Status: WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids To Support GSI-191"
- Staff Comments: WCAP-16785-NP "Evaluation of Additional Inputs to the WCAP-16530-NP."
- Additional NRC sponsored tests



WCAP-16530-NP Status

- NRC staff review in progress
- NRC- PWR Owners Group have been interacting, PWROG performed testing to support technical issue resolution:
 - Chemical precipitate filterability model/testing
 - Surrogate precipitate settlement acceptance criteria
 - Potential effects from release of reactor coolant system oxides
 - Aluminum release rates
- As indicated during 8/20/07 call with PWROG, NRC staff has sufficient information for a safety evaluation
- NRC staff safety evaluation projected for November



WCAP-16785-NP: NRC Staff Comments

- Evaluates and proposes to reduce certain conservative assumptions in the WCAP-16530-NP chemical model
- Submitted to the NRC for information
- NRC staff providing some initial feedback since licensee chemical effect evaluations are in progress:
 - Phosphate Inhibition of Aluminum Corrosion
 - Silicate Inhibition of Aluminum Corrosion
 - Solubility of Aluminum and Calcium
 - Overall Impression



WCAP-16785-NP: NRC Staff Comments

- Phosphate Inhibition of Aluminum Corrosion
 - Plants with TSP buffer have a known quantity of phosphate
 - Given tests were performed with immersed coupons, staff has questions about inhibition of non-submerged aluminum, e.g., timing of TSP dissolution relative to containment spray (CS) termination, efficiency and timing of aluminum inhibition by spray

- Silicate Inhibition of Aluminum Corrosion
 - Silicate source term is break specific and determining the break that results in overall maximum head loss will be an iterative process
 - Staff has questions about inhibition of atmospheric aluminum, e.g., timing of silicate pool concentration relative to containment spray (CS) termination, efficiency and timing of aluminum inhibition by spray
 - Presence of dissolved aluminum inhibits Si leaching from fiberglass (ICET). WCAP-16530 model, based on single effects, over predicts Si released in these conditions



WCAP-16785-NP

NRC Staff Comments

- Solubility of aluminum and calcium
 - WCAP-16530-NP model assumes all dissolved calcium (in the presence of phosphate) and all dissolved aluminum precipitates
 - The degree of conservatism associated with the assumption of precipitation of all dissolved aluminum is a strong function of temperature and pH
 - WCAP-16530-NP chemical model predictions of the relative amounts of sodium aluminum silicate and aluminum oxyhydroxide are based on thermodynamic predictions that may not be accurate
 - Staff thinks it will be difficult to determine the applicability of the WCAP-16785-NP test results to plant-specific conditions to justify solubility limits
- Overall Staff Comment:
 - Conservative assumptions in the WCAP-16530-NP model were intended to balance chemical effects uncertainties. Staff review of WCAP-16530-NP indicates that some aspects of the model are non-conservative, however, these are offset by conservative assumptions. Licensees that are implementing “refinements” to the base chemical model should ensure their plant specific chemical effects evaluations remain conservative



Additional NRC Sponsored Tests

- Objective: support an independent assessment of licensee chemical effects evaluations
- Work Scope:
 - Vertical head loss loop tests to compare head loss properties of chemical precipitate prepared using the WCAP-16530-NP protocol and precipitate formed by chemical injection
 - Evaluation of settlement properties for various precipitates
 - Limited evaluations of aluminum solubility



Path Forward – Chemical Effects

- RES and NRR working on disposition of RES peer review panel member comments contained in NUREG-1861 (peer review) and identified by the phenomena identification ranking table
- NRC staff continues to visit vendor facilities and assess ongoing industry chemical effects testing
- Complete staff review of WCAP-16530-NP and issue SE
- NRC staff developing draft guidance for review of licensee chemical effects evaluations to be provided in Generic Letter 2004-02 supplemental responses (Fall 2007)
- NRC sponsoring some additional testing at Argonne National Laboratory
- Targeted chemical effects and downstream audits in 2008